The Newer Insecticides

By LAURENCE A. CARRUTH

The effective use of insecticides is an important element in the successful production of many Arizona crops. In a single season as many as 17,000,000 pounds of insecticides have been used within the state. A demand of this magnitude has developed because of the importance of the insect problem and the availability of effective materials at reasonable prices. A large proportion of the insecticide tonnage sold includes materials largely unknown a decade ago which have been developed by relatively recent research by public and industrial agencies.

Two Groups

Insecticides may be placed in two large groups according to their chemical nature. The first group comprises those of an inorganic character, containing such elements as arsenic, fluorine, sulfur, antimony, and others.

The second group comprises those of an organic nature and includes insecticides of plant origin, petroleum oils, fumigants, and various synthetic organic insecticides. The most striking development of the last decade has been the introduction of a number of remarkably effective synthetic organic insecticides.

Among the inorganic insecticides those containing arsenic, for example, have been replaced to a considerable extent, in the control of grasshoppers and cotton insects, by newer materials. On the other hand, the consumption of elemental sulfur, which serves both as an insecticide and as a diluent for other insecticides, has definitely increased. Other inorganic insecticides continue to be used for special purposes as, for example, cryolite. This fluorine insecticide is useful in cases where a long residual action is desired and no serious residue or plant injury problems are present.

Certain organic insecticides of plant origin, such as pyrethrum, are needed in cases where no toxic residues are permissible, as in homes, restaurants, and food-processing establishments, but where immediate "knock down" of flies and other insects is required.

The consumption of other insecticides of plant origin, such as those containing rotenone or nicotine, has been materially affected by the appearance of the newer synthetic organic insecticides.

Synthetic Insecticides

The more important synthetic organic insecticides, all of which have been developed commercially only within the last decade, include DDT, benzene hexachloride, chlordane, toxaphene, parathion, and TEP (tetraethyl pyrophosphate). Numerous other synthetic organic insecticides have been introduced although most have been found less effective, of limited potential use, or less fully developed than those mentioned. Most of these names have been officially coined to replace long and elaborate chemical designations.

Only chlordane and toxaphene are of American origin. Parathion apparently originated in Germany prior to and during World War II. Despite their recent use as insecticides, DDT, benzene hexachloride, and TEP, all of European origin, had been known as chemical compounds since 1874, 1825, and 1854, respectively.

Present Insect Control Programs Use Materials Unknown a Decade Ago

DDT, benzene hexachloride, chlordane, and toxaphene are known as chlorinated hydrocarbons and in their pure states contain 52, 73, 89, and 69 per cent, respectively, of chlorine. As a group they are noted for their insecticidal effectiveness, residual effects, and relative safety to plants, with some variations and exceptions.

Because of relatively long periods of residual effectiveness certain problems may arise when these materials are applied to plants intended for human or animal consumption. (Under Arizona weather conditions certain of these residues may persist on foliage for shorter periods than may occur elsewhere.)

It is probable that the Food and Drug Administration of the Federal Security Agency will shortly announce regulations limiting the quantities of these and other insecticides legally permitted on fresh plant products offered for sale for human consumption.

Another problem associated with these newer insecticides, notably DDT, has been a tendency for insects, through successive generations, to develop a tolerance or resistance to a particular insecticide. This tendency has been particularly evident in the case of flies and is being watched with interest.

Chlorinated hydrocarbon insecticides are relatively safe to apply from the standpoint of the operator when due precautions are observed. DDT has a pleasant fruity odor. Benzene hexachloride has a persistent, unpleasant odor which prevents its use on plants intended for human consumption, although this odor is not objectionable on cotton.

A "purified" form of benzene hexachloride, consisting largely of but one of the several chemical forms, or isomers, of the compound, has been given the name lindane. In this product the objectionable odor of technical benzene hexachloride has been largely eliminated. Chlordane has been used widely for controlling soil insects, household pests, and grasshoppers.

Toxaphene has also been effective against grasshoppers and certain pests of cotton and alfalfa. Aldrin and dieldrin are two relatively new chlorinated hydrocarbon insecticides now emerging from the developmental stages which show definite promise of future usefulness.

Parathion and TEP belong to a group of insecticides known as organic phosphates. They are effective against numerous insects and are more effective than chlorinated hydrocarbons against most aphids and mites. TEP has almost no residual action and may therefore be used on edible plants shortly before harvest.

Parathion has a more prolonged residual action, the time varying according to the temperature and other factors.

Precautions Necessary

According to the Food and Drug Administration, parathion and TEP are 70 and 125 times, respectively, more toxic to warm-blooded animals than is DDT. Careful precautions must be taken in the application of these insecticides and the manufacturer's instructions should be scrupulously followed.

In general, organic phosphate insecticides are used only when other, safer materials are less effective against the pests it is desired to control.

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Cutting Costs of Marketing Citrus

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Los Angeles and about 125 in Tucson revealed that the average retail mark-up for fresh grapefruit was comparable to that for more perishable produce (such as apples).

Many leaders in the Desert grapefruit industry believe that the present laboratory maturity standard does not accurately reflect consumer acceptability of grapefruit. A series of taste tests with consumers and a selected taste panel indicated that taste testing, after much more research, might be incorporated in the laws which determine minimum maturity. Then "legally" mature fruit would be more acceptable to consumers.

Agricultural Experiment Station Bulletin 230 outlines the history of acreage, production, utilization, shipments, markets and prices of the Desert grapefruit industry. Also included are the descriptions of the process of harvesting, packing, wholesaling, retailing, and the activities of the industry's marketing committees.

—George W. Barr is Head of the Department of Agricultural Economics.

ARIZONA MELONS

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melon growing conditions in the Imperial Valley. It would seem that sugar beet acreages within melon growing districts create biological conditions unfavorable for healthy melon production.

Honey Dew melons are grown in newly irrigated desert areas because the vines are sensitive to mosaic damage brought on by insect vectors which become more serious in older cultivated areas.

Fertilizer Requirements

The fertilizer requirement for improved melon production in Arizona has not been satisfactorily determined. Some growers do not fertilize melons, especially when following a crop of lettuce. Dr. W. D. Pew, University of Arizona Vegetable Research Farm at Tempe, has initiated field tests with respect to fertilizer, irrigation and spacing requirements of cantaloups. These tests have already indicated favorable responses from applying manure, nitrogen and phosphate.

Irrigations following first picking showed no benefit. Spacing plants six inches apart in the row was favorable. Art Lange of the staff is developing melon leaf diagnosis techniques.

The improvement of Arizona's leading position in the nation's early season melon industry is one of the chief objectives of the University of Arizona agricultural research program.

—Leland Burkhart is Head of the Horticulture Department.

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Other Controls

It must be emphasized that the use of insecticides represents but one form of insect control. Whenever practical, the use of non-chemical methods, such as the encouragement of natural insect enemies or the use of cultural practices should be followed.

The widespread use of the newer and more effective insecticides has also reduced the numbers of native insect parasites and predators and may also affect the number of pollinating insects present in an area.

Research projects involving the study of the performance of the newer insecticides on crops and insects of importance in Arizona are now being conducted by the Arizona Agricultural Experiment Station and by members of the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture working in the state.

The Arizona Agricultural Experiment Station is now developing new facilities for the preliminary testing of insecticides at the Campbell Avenue Farm north of Tucson. The more promising materials and combinations will be tested further under commercial conditions found in the major agricultural areas of the state.

Current recommendations concerning the use of insecticides on Arizona crops may be obtained from your County Agricultural Agent.

—Laurence A. Carruth is Entomologist and Head of the Department.

Better Meals Away From Home

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recipes, purchase amounts, duties of committees, and comments.

Additional Information

Additional information for community meals may be obtained from institution books and booklets. Some which would be of assistance in planning community meals are:

1. Cooking for Fifty, by Betty Crocker. General Mills, Inc., Minneapolis, Minnesota. (Price 15c.) This booklet includes recipes, amounts to purchase and suggestions for church suppers.
2. Armour Meats for Quantity Cookery, Buying Guides and Recipes, by Marie Gifford, Director of Food Economics, Armour and Company, Chicago, Illinois. (No charge.)
3. Cooking Meat in Quantity. Department of Home Economics, National Live Stock and Meat Board, 407 South Dearborn Street, Chicago 5, Illinois. (Price 25c).
4. Large Quantity Bread Recipes, by Clara Gebbard Synder. Wheat Flour Institute, 309 West Jackson Blvd., Chicago, Illinois. (No charge.)
5. Canned Food Recipes for Serving Fifty, and a leaflet, Servings Per Unit for Various Canned Foods in Common Can and Jar Sizes. Home Economics Division, National Canners Association, Washington, D. C. (No charge.)
6. Recipes for Quantity Service. PA-112, June 1950 (Food Service I) and PA-135, September 1950. (Food Service II). Bureau of Home Nutrition and Home Economics. Agricultural Research Administration, U. S. Department of Agriculture. (No charge.)
7. Meals for Many, by Katherine W. Harris and Marion A. Wood (1942). Cornell Bulletin No. 477, New York State College of Home Economics, Cornell University, Ithaca, New York. (Price 30c.)
8. Manual for School and Institutional Lunchrooms, Revised 1946. Prepared and published by the Ohio Dietetic Association, Room 1016, 1001 Huron Road, Cleveland 15, Ohio. (Price $2.00.)
9. Food for Fifty, by Sina Faye Fowler and Bessie Brooks West. 3rd edition 1950, John Wiley and Sons, Inc., New York City. (Price $4.50.)

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